SKAPAR INTELLIGENTA TANKAR

MicroTREK 2-wire

Guided microwave level transmitter

INSTALLATION

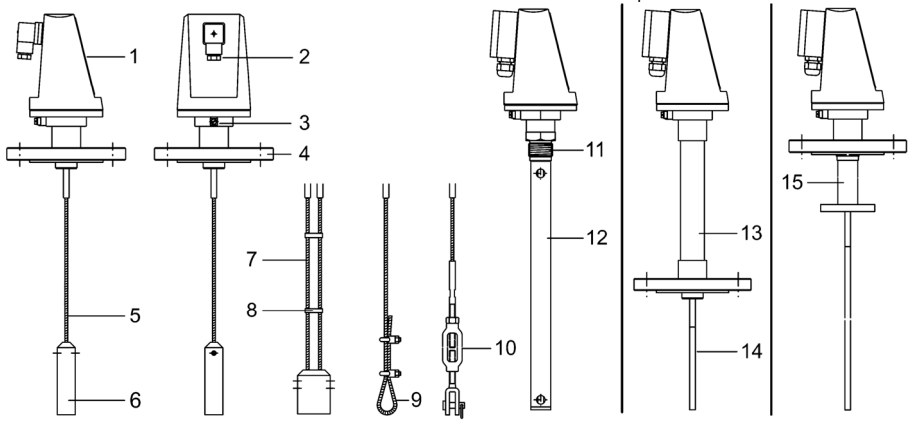
DEVICE DESCRIPTION AND RANGE OF APPLICATIONS

The MicroTREK 2-wire level gauge uses the Time Domain Reflectometry (TDR) measuring principle and two-wire technology for level measurement. It is designed solely for measuring the distance, level, volume and ullage of liquids, pastes, slurries and powder products. It can continue to measure the level or distance and total volume in applications with two products.
The level measurement data can be displayed and the gauge configured using either a HART Handheld Communicator console (HHC) or a PC work station equipped with PCSTAR2 software supplied as standard with the gauge.
Principal gauge components

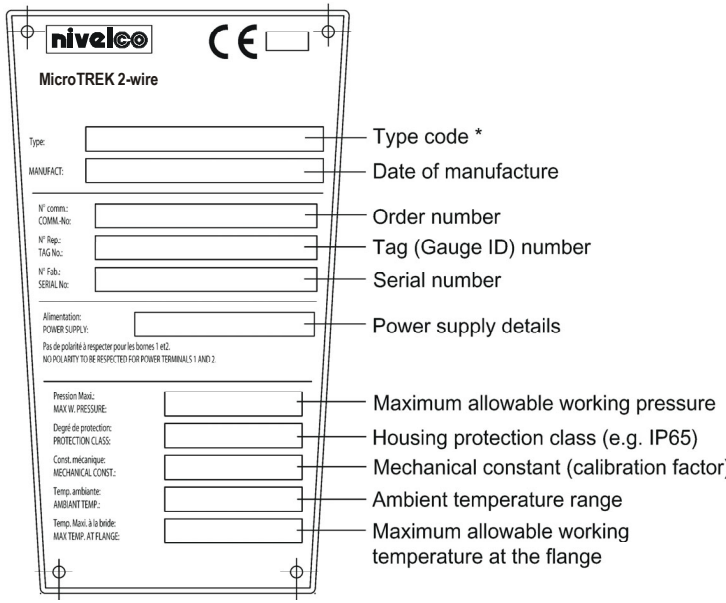
MicroTREK 2-wire housing and probes (non-Ex and Ex versions)

with high-temperature option

with raising converter option



1 Nameplate (see next page for details)
2 Cable entry (output and power supply) to wiring compartment
3 Equipotential bonding system connection (Ex – see section 2.1.4)
4 Flange (process connection onto tank or other suitable mounting)
5 Single cable probe
6 Counterweight (with threaded hole in base for anchoring)
7 Twin cable probe
8 Spacer
9 Chuck / ring (for single cable probes)
10 Turnbuckle (for twin or single cable probes)
11 Threaded process connection (e.g. 1" G, 1" NPT, …)
12 Coaxial probe
13 Extension tube for high temperature applications
14 Single rod probe
15 Raising converter: coaxial tube under the process connection (i.e. an inactive length of the probe) for installations with long nozzles or concrete roofs – for single rod and single cable probe versions only



Standard nameplate

*eg. ABM-110-1. The “type code” gives the options chosen for this unit and is defined in the MicroTREK 2-wire Data Sheet. This document is available from your local NIVELCO Sales office or on the “Download” site on NIVELCO’s website http://www.nivelco.com/.

Items included with supply:

The scope of supply encompasses:
Signal converter with probe in the version ordered. The version is stated on the nameplate.
PCSTAR 2 computer software for data display and gauge configuration

Documentation supplied:

Installation & programming manual:
Installation, connection, start-up and safety advice.
Detailed user manual and reference book, including how to configure meter parameters available in the user menu and how to perform basic maintenance.

Supplementary Installation and Operating Instructions MicroTREK 2-wire
KEMA 03ATEX1565X
Supplementary instructions covering devices to be installed and used in hazardous areas.
This document is only supplied with specially approved instruments. This document is available from your local NIVELCO Sales office or on the “Download” site on NIVELCO’s website http://www.nivelco.com/.

Product liability and warranty:

The MicroTREK 2-wire TDR level gauge is designed for measuring the distance, level, and volume of liquids, pastes, slurries and powders. It may equally measure level, distance, total volume and ullage in applications where two or more products are present.

Special codes and regulations apply to its use in hazardous areas : please refer to the MicroTREK 2-wire KEMA 03ATEX1565X Supplementary Installation and Operating Instructions for further information. This document is available from your local NIVELCO Sales office or on the “Download” site on NIVELCO’s website http://www.nivelco.com/.

Responsibility as to suitability and intended use of these level gauges rests solely with the user.
Improper installation and operation of our level gauges may lead to loss of warranty.
In addition, the "General conditions of sale", forming the basis of the purchasing contract, are applicable.

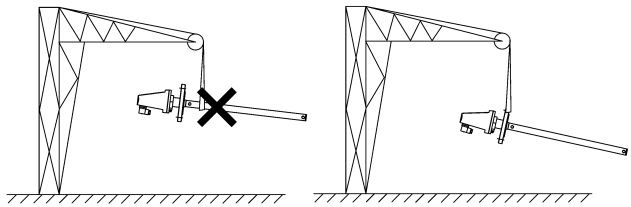
If you need to return measuring instruments to NIVELCO, please note the information given in Appendix C. NIVELCO regrets that they cannot repair or check your device unless it is accompanied by the completed form.

The level gauge does not form part of an overfill protection system (as defined for example in WHG: German water resources act).

1. MECHANICAL INSTALLATION

1.1 HANDLING AND STORAGE

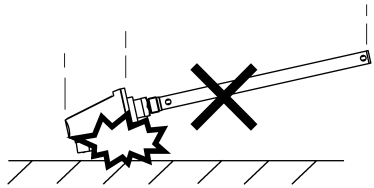
To carry: the device will weigh between approx. 3 kg or 7 lb and 12 kg or 25 lb.
Carry using both hands to lift the device carefully by the converter housing. If necessary, use lifting gear.
No attempt should be made to lift the instrument by its probe.
Caution:
The probe is a critical gauge component.
Do not damage– Handle with care!!!



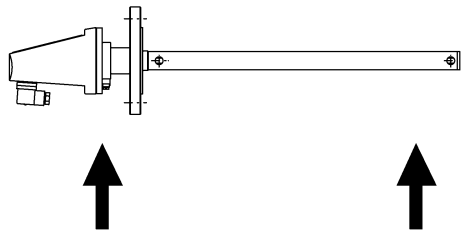
Avoiding blows
When handling the MicroTREK 2-wire, avoid hard blows, jolts, impacts, etc.

Caution:

Fragile electronics

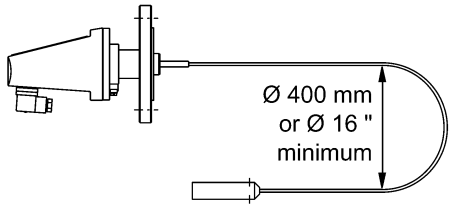


Avoid bending (single rod and coaxial probes)
Support the probe to avoid bending.

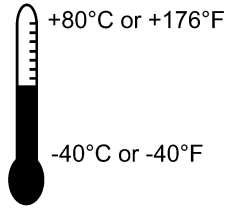


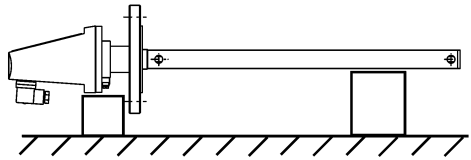
Support probe here

Avoid cable kinks and fraying
Do not coil the cable less than 400 mm or 16 " in diameter. Cable kinks or fraying will cause measurement errors.



Storage temperature
Store within the given storage temperature limits.





1.2 INSTALLATION RESTRICTIONS

Hazardous-duty systems (Ex, FM,…)
Refer to the MicroTREK 2-wire KEMA 03ATEX1565X Supplementary Installation and Operating Instructions for further information on installing gauges approved for use in hazardous locations. This document is available from your local NIVELCO Sales office or on the "Download" page on NIVELCO's website http://www.nivelco.com/.
Check that the flange, gasket and probe materials are compatible with the product. Read the information given on the converter nameplate, the flange markings and specifications in the approval certificates.

1.3 MOUNTING ON THE TANK

1.3.1 INSTALLATION INSTRUCTIONS: GENERAL NOTES

The fitter should give some thought to tank fittings and tank shape.
nozzle position in relation to the tank walls and other objects inside the tanks
(Warning : this free area will depend on the probe type selected: refer to later on in this section)
type of tank roof, i.e. floating, concrete, integral, etc; and base, i.e. conical, etc.
Whenever working on an installation, remember to:
Disconnect the power supply before starting work.
However, the gauge may be installed when the tank contains product.

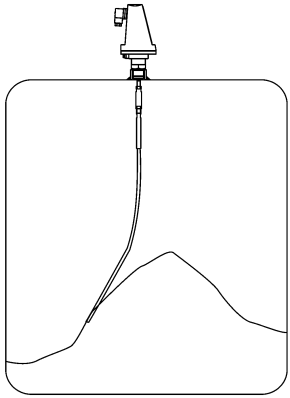
1.3.2 INSTALLATION INSTRUCTIONS: NOZZLE

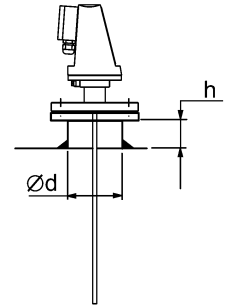
Threaded process connections

The simplest and most economic way is to mount the MicroTREK 2-wire directly on the tank with the 1"G or 1"NPT threaded connection.

Nozzle height

Recommendation
Do not fit a nozzle longer than its diameter, especially for single probes and powder applications





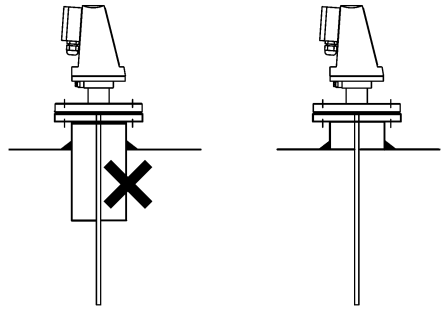
h ≤ Ød , where h = nozzle height and
d = nozzle diameter

Contact NIVELCO if this relationship cannot be respected.

Nozzles extending into tank

Caution:

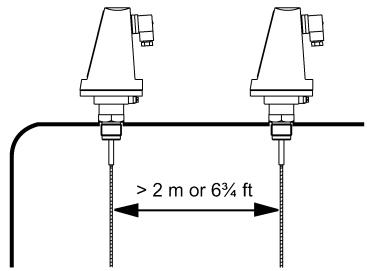
Do not use nozzles that extend into the tank. This will disturb the emitted pulse.



Installation of two devices

If two devices are to be used on the same tank, these should be mounted at a distance of at least 2 m or 6.5 ft away from each other. If not, interferences from the electromagnetic (EM) fields generated by both instruments may cause measurement errors.

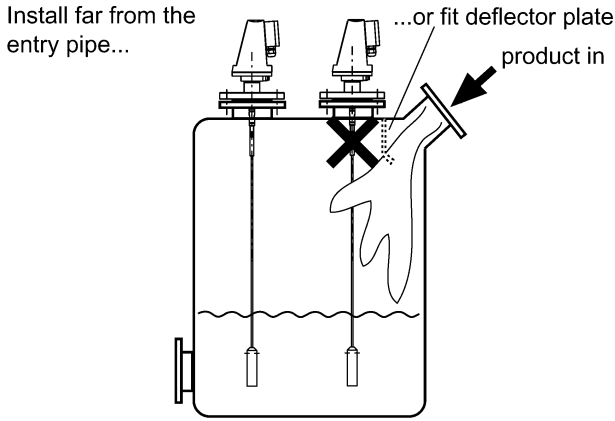
Not applicable to coaxial probes - the outer shell of the probe contains the EM field: no minimum distance required.



Process connection

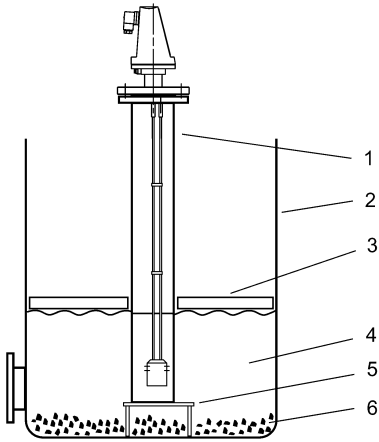
For the gauge to make accurate measurements:
the tank process connection must be level.
ensure a good fit with the gauge process connection
the tank roof should not deform under the weight of the gauge
Process connection and entry pipe

Caution:
Do not put the nozzle close to the entry pipe. Pouring the product directly onto the probe will give false readings. Install deflector plate if impossible to distance gauge from entry pipe.



Stilling wells

Tanks with floating roofs for petrochemical applications: Use a stilling well.



1 Stilling well

2 Tank

3 Floating roof

4 Product (petroleum applications)

5 Well fixed to tank base (no roof deformation)

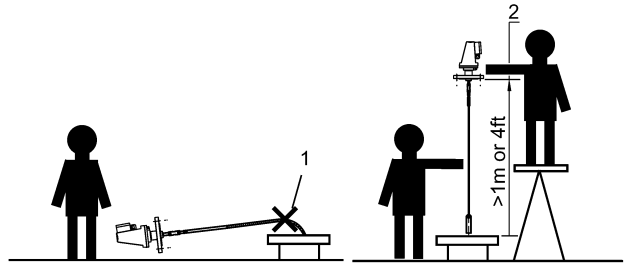
6 Sediment

1.3.3 INSTALLATION INSTRUCTIONS: GAUGE - ALL APPLICATIONS

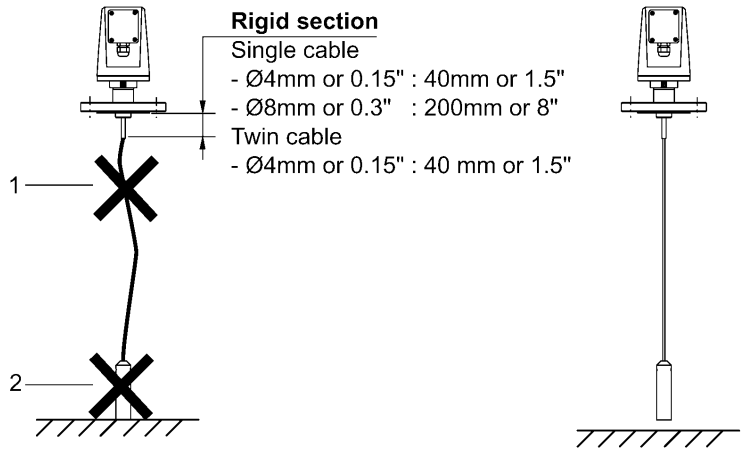
MicroTREK 2-wire gauges are designed to be mounted on a suitable process connection on a tank or sump. Install the gauge using two people to avoid damaging the probe. Support the housing and the probe.

Installation of single and twin cable probe level meters

1 Caution :
Do not over-bend probe!
2 Inserting the probe:
hold more than one metre above the opening to avoid cable bending.



Probes: entanglement, straightness and tank bottom clearance



Cable probes must be straight once inserted into the tank. They must also be far from other objects (e.g. mixers) to avoid entanglement.
In order to maintain the gauge's operating characteristics, it is recommended to avoid touching the tank bottom with the counterweights (for cable probes) or probe end (other types).

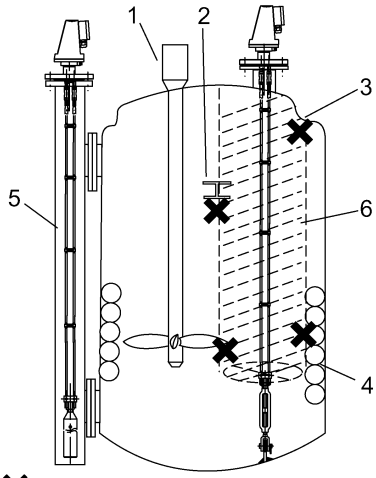
Objects (discontinuities) inside the tank that influence the probe's EM (electromagnetic) field

Install the gauge far from protruding objects such as:
heating tubes,
sudden changes in tank cross-section,
tank wall reinforcements and beams,
weld lines and dip-stick pipes, etc...

TDR gauges generate electromagnetic (EM) fields when a measurement pulse is emitted. This field is affected by any nearby discontinuities and these will weaken and potentially block the emitted pulse. A minimum distance is recommended depending on the probe type to be installed. See the table on the next page for recommended free space dimensions. Alternatively, the fitter may use a reference chamber or stilling well. However, the chamber walls must be smooth (i.e. no visible weld lines), straight and vertical to maintain the pulse strength and gauge accuracy.

For clean applications only :

Coaxial probes may be used close to or touching objects or walls as the EM field generated by the probe is contained within the probe's outer sheath (refer also to the EM field sizes/free area given in the figures on the next page).

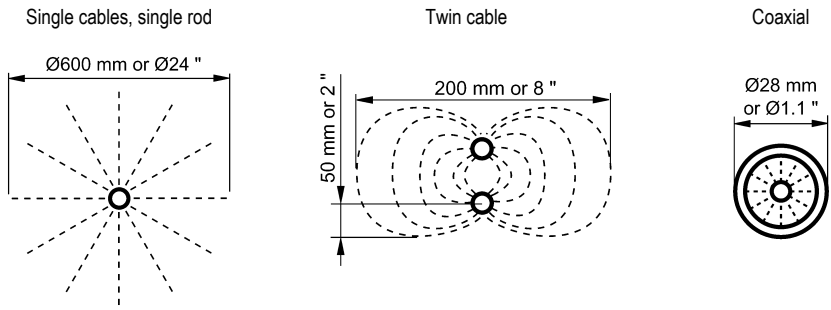


✕ = Do not fit the gauge near to these objects.

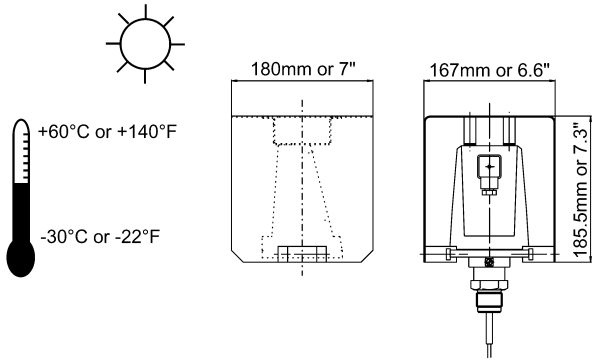
1 Agitator
2 Support beam perpendicular to the pulse direction
3 Abrupt changes in tank cross section
4 Heating tubes
5 Alternative solution: reference chamber –electromagnetic field is contained within chamber
6 Gauge electromagnetic field :
Any intruding metallic object will be detected in this zone if perpendicular to the emitted pulse direction.

Probe Type	Recommended minimum distance of probe from objects inside the tank
Single cable ∅ 4 mm, Single cable ∅ 8 mm, Single rod	300 mm or 12”
Twin cable	100 mm or 4”
Coaxial	0 mm or 0”

Electromagnetic field shape around probe, by type (not to scale)

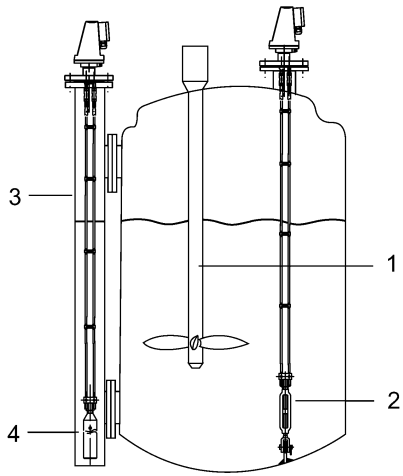


No beam angle for any probe type.
Avoid direct solar radiation.
Fit a sunshade on the gauge for open-air installations: this is either supplied on demand by NIVELCO or provided by the customer. The ambient temperature limits of the gauge are given below.



1.3.4 SPECIFIC INSTALLATION INSTRUCTIONS: GAUGE - LIQUID APPLICATIONS

Probe bending in agitated products: recommended solutions



1 Agitator

2 Turnbuckle for anchoring probe to tank bottom

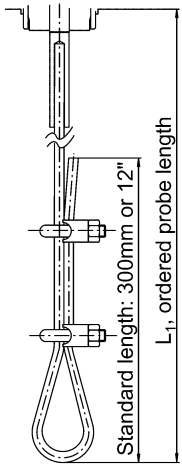
3 Bypass chamber

4 Probe and counterweight (centred on request)

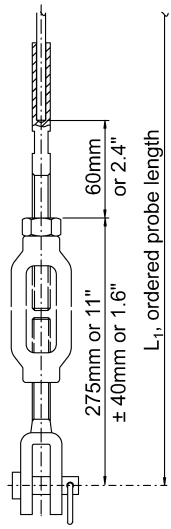
Mounting on a reference vessel or still well is ideal. To ensure that the probe does not come into contact with the tank wall, the probe should be fixed to the bottom of the chamber or centred.

Fastening the probe to the tank bottom

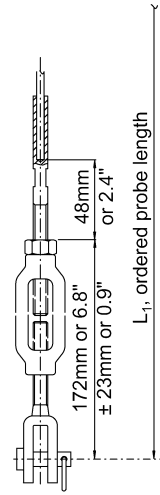
Flexible probes can be fastened with a chuck (ring), turnbuckle or similar fastening device to the tank bottom:



Chuck (ring)



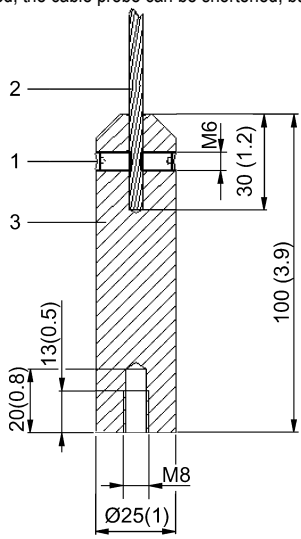
Turnbuckle
for Ø8 mm cable probes



Turnbuckle
for Ø4 mm cable probes

Shortening cable probes

If required, the cable probe can be shortened, but this applies only when used in liquids.

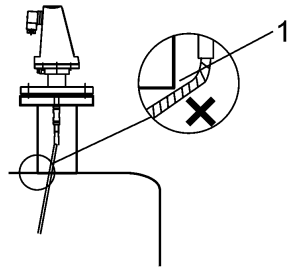


Procedure

Step	Action
1	Detach socket set screw M6x10 (ISO 4026) with 5 mm Allen (hexagon) key (ISO 2936).
2	Pull cable (2) out of counterweight (3) and shorten to required length using cable cutters to prevent the cable wires and strands from splaying out.
3	Insert cable back into counterweight and tighten down screws
4	Change configuration parameters to new probe length; the reference point is the top edge of the weight (user menu function 1.1.6) Dimensions in mm (inches).

1.3.5 SPECIFIC INSTALLATION INSTRUCTIONS: GAUGE - SOLID APPLICATIONS

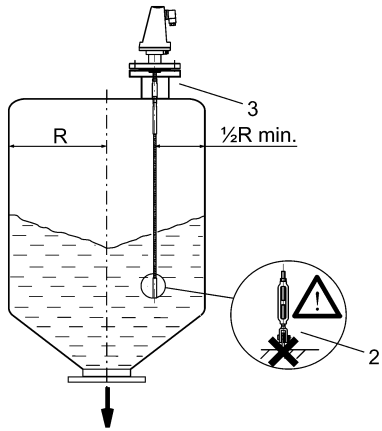
False readings:



1 Do not let probe touch the side of the nozzle

Conical silo nozzles, false readings and traction on the cable probes

Caution



2 High traction forces :
We recommend that the probe should not be anchored to avoid excessive traction loads on the cable.

3 Bending and traction:
Position the connection on the roof at ½ radius of the tank and with minimum nozzle height. This will avoid damage due to bending and traction during emptying.

Traction forces during emptying cycles for powder applications

Traction load is dependent upon the height and shape of the tank, product particle size & density, and the rate at which the tank is emptied. The table below gives the load up to which cable probes will hold.

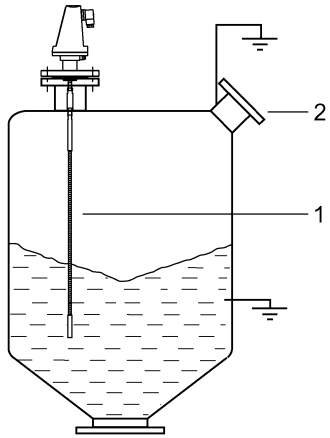
Cable maximum design load, traction
Probe
Maximum Load
Single cable Ø8 mm or Ø0.3"
3.5 T or 7700 lb
Traction on cable according to product (approximate value in metric tons)

		Probe Length / m (ft)		
Probe used	Material	10 (33)	20 (65.5)	30 (98.5)
Single cable Ø8mm or Ø0.3"	Cement	1.0 T or 2200 lb	2.0 T or 4410 lb	3.0 T or 6620 lb
	Fly ash	0.5 T or 1100 lb	1.0 T or 2200 lb	1.5 T or 3300 lb

Electrostatic discharge (E.S.D.)

MicroTREK 2-wire non-Ex and Ex gauge electronics are shielded up to 4 kV against E.S.D..

Note:
E.S.D. cannot be solved by MicroTREK 2-wire E.S.D. protection. It is the customer's responsibility to avoid E.S.D. by grounding the tank, product and probe installation.



1 Danger of injury

The probe may receive an electrostatic discharge during operation; earth the probe by pushing it against tank wall with a suitably isolated tool just before touching it to avoid receiving a shock.

2 Earth the entry pipe and product.

Product deposits on the nozzle and probe

Product build-up can occur under the nozzle: this may weaken the pulse. Avoid cavities that permit the build-up of deposits.

Tank roof deformation

Tank roofs should support loads of at least 3.5 tonnes or 7700 lb for gauge installations using Ø8mm or 0.3" single cable probes.

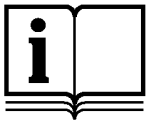
2 ELECTRICAL CONNECTIONS

2.1 ELECTRICAL INSTALLATION INSTRUCTIONS

2.1.1 WIRING GENERAL NOTES

Connection to power is effected at the plug connector in the signal converter. Two wiring compartments are available: DIN connector or M16 terminal box. Observe applicable rules and regulations for cable connection: VDE 165 or equivalent national regulations.
Always disconnect from power supply before opening wiring compartment. This is not mandatory for Exi applications.

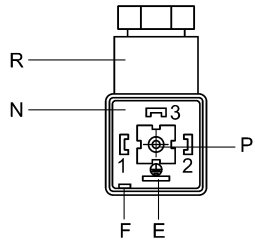
Hazardous-duty systems



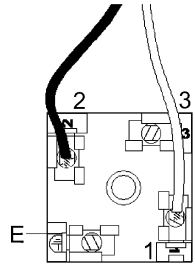
Only certified intrinsically safe equipment may be connected to the MicroTREK 2-wire in hazardous areas. Please refer to the MicroTREK 2-wire KEMA 03ATEX1565X Supplementary Installation and Operating Instructions for further information. This document is available from your local NIVELCO Sales office or on the "Download" site on NIVELCO's website http:// www.nivelco.com/.

2.1.2 WIRING CONNECTIONS: DIN CONNECTOR

Terminals:	3 poles and 1 x ground. Wire cross-section: max. 1.5 mm² (AWG 16)
Cable entry:	1 x PG11, cable diameter: 8 … 10 mm (0.31 … 0.39"), IP 65
Shielding:	do not connect to the DIN connector.
Signal cable:	no shielding required



1 Detach screw P and remove plug from signal converter.
2 Separate part N from part R by inserting the flat tip of a screwdriver into gap F.
3 Connect current loop to terminals 1 and 2 (any polarity). Use ferrules to protect cable ends. Terminals 3 and E are not connected.
4 Fit parts N and R together again.
5 Fit gasket, re-insert connector plug R on the signal converter, and replace screw P.



Grounding terminal E is not connected to the housing of the signal converter or to the device flange. To avoid ground current loops, the cable shielding may not be connected at both ends.

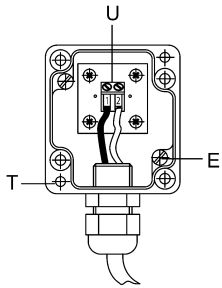
Hazardous-duty systems
When used in hazardous areas, only one intrinsically safe power supply may be connected to terminals 1 and 2. Ground terminal E and terminal 3 are not connected.

2.1.3 WIRING CONNECTIONS: M16 TERMINAL BOX

Power terminals:	Wire cross-section: max. 1.5 mm² (AWG 16)
Cable entry:	1 x M16 x 1.5, cable diameter: 3.5 … 8 mm (0.14 … 0.31"), IP 65 for USA: ½" NPT conduit connection
Shielding:	Do not connect shielding to the terminal compartment.

Hazardous-duty systems
When used in hazardous areas, only one intrinsically safe power supply may be connected to terminals 1 and 2. Ground terminal E is not connected.

Caution
Ground terminal, E, is not connected to the signal converter housing or to the device flange. To avoid ground current loops, the cable shielding may not be connected at both ends.



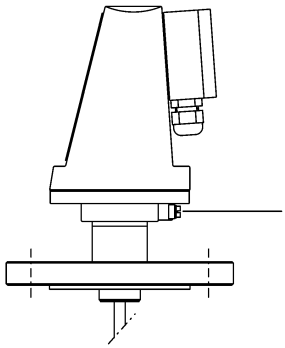
1 Detach the 4 screws T, and remove cover from terminal compartment.

2 Connect the cable ends, fitted with ferrules, to the power terminal U (not polarity sensitive).

3 Shut the terminal compartment.

2.1.4 'EX' EQUALIZING CONDUCTOR

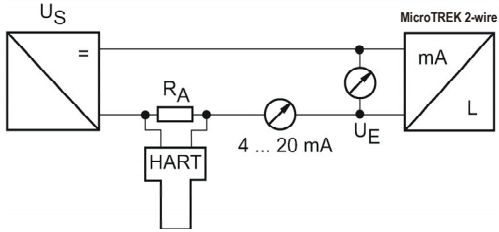
Refer to the MicroTREK 2-wire KEMA 03ATEX1565X Supplementary Installation and Operating Instructions for further information.



Terminal for equipotential bonding
U-clamp terminal,
max. conductor cross-section:
4 mm²/6.2 • 10^{-3} sq.in. on 'neck' of signal converter

2.2 POWER SUPPLY

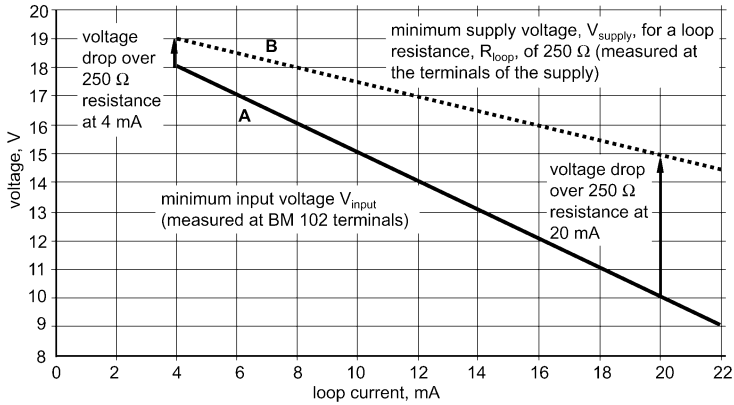
2.2.1 NON-HAZARDOUS-DUTY VERSION



Power supply	
Rated voltage	24 V DC
Max. voltage (U_{input}):	35 V DC 'Ex' = 28 V DC
Min. voltage (U_{input}):	dependent on load impedance, see graph below

A supply voltage above 35 V DC can cause irreparable damage to the signal converter.
Also, power supply voltages above the specified max. values and below the specified min. values can lead to faulty measurements or to a device reset.

Load impedance R_A		
Loop resistance, R_{loop}	$R_{HART} + R_{cable} + R_{ammeter}$	
Min. R_A	0	Ω
Max. R_A	750	Ω
R_{HART} resistance for HART® communication	250	Ω (recommended)



Line A = minimum voltage at the MicroTREK 2-wire terminals
Line B = minimum supply voltage (for voltage drop caused by a 250 Ohm loop resistance)

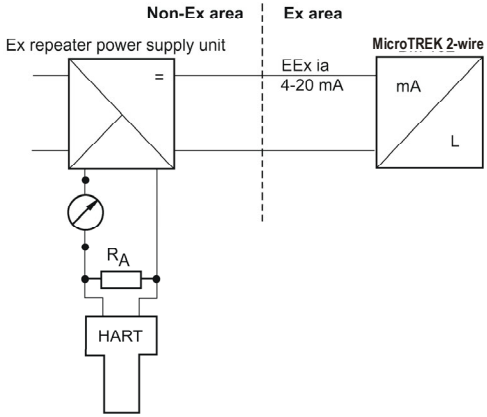
Example for calculating the power supply:
The voltage drop is tested at 22 mA.
$U_{power\ min.\ 22}$ = 22 mA x load impedance + $U_{input\ min.\ 22}$
$U_{power\ min.\ 22}$ = 22 mA x 250 Ω + 10 V = 5.5 V + 10 V = 15.5 V

In order to cover the whole current range, the voltage drop must also be tested at 4 mA.
By analogy, the following applies:
$U_{power\ min.\ 4}$ = 4 mA x load impedance + $U_{input\ min.\ 4}$
$U_{power\ min.\ 4}$ = 4 mA x 250 Ω + 18 V = 1 V + 18 V = 19 V

At a load impedance of 250 Ω a power supply voltage of 19 V is sufficient to energize the current device range of 4 to 20 mA.

2.2.2 HAZARDOUS-DUTY VERSION

The certified device may only be used with other 'Ex' certified equipment. The minimum electrical safety data indicated on the nameplate must be observed. To ensure proper operation, the minimum parameters specified above in section 5.4.1 for the supply power must be observed to ensure that a given 4 to 20 mA converter is adequate for use with the MicroTREK 2-wire. For more information refer to the MicroTREK 2-wire KEMA 03ATEX1565X Supplementary Installation and Operating Instructions for further information. This document is available from the "Download" page on NIVELCO's website http:// www.nivelco.com/.



In addition, the connected equipment must be HART®-compatible so that it can be operated with the communication software or the HART® communicator.

An 'Ex' repeater power supply unit must be used. For calculation of the supply voltage the same applies as for the non-'Ex' version.

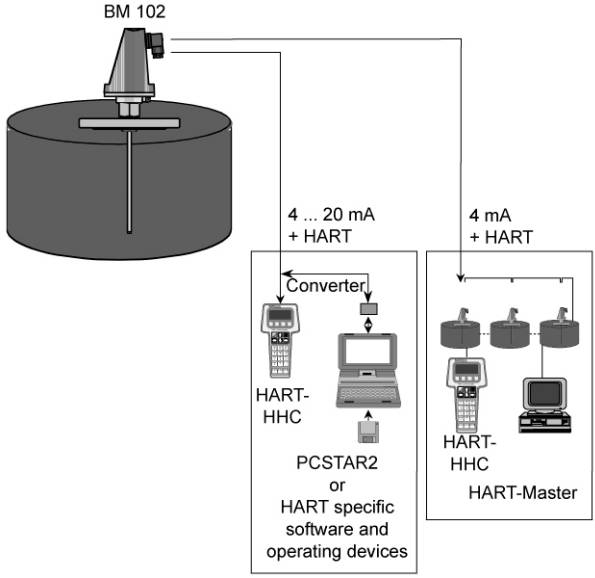
2.3 ELECTRICAL OUTPUT

2.3.1 NETWORK OPTIONS

The output is available in 2 versions:

Current output HART®,	passive, HART® protocol
Current output Ex-ia HART®	intrinsically safe; passive, HART® protocol

All versions with HART® protocol can be operated with the PC-STAR 2 program.



mcd AB
Gasverksvägen 1
SE-611 35 Nyköping
Tel: + 46 (0) 155 - 22 27 90
Fax: + 46 (0) 155 - 22 27 99
E-post: info@mcd.se
www.mcd.se
Org nr: 556215-2180
Vat nr: SE556215218001